

AMENDMENTS TO THE CLAIMS

Please amend the claims as indicted below:

1-28. (Canceled)

29. (Currently Amended) A system of joined structures, comprising:
a first structure having a first aperture in a composite material, the first aperture having a first interior surface and a first minimum radial extent, the composite material configured so that a small radial force to the first internal surface will damage the composite material;
a second structure having a second aperture in a metallic material, the second aperture having a second interior surface and a second minimum radial extent at least approximately the same as the first minimum radial extent;
and
a coupling device having a first shank section extending through the first aperture and a second shank section extending through the second aperture, but not extending into the first aperture, the first shank section of the coupling device having at least one of a hardness, toughness, and density greater than that of the second shank section of the coupling device, wherein:
a portion of the second shank section has a greater radial extent than the first shank section;
the portion of the second shank section applies a first radial force to the second interior surface and the first shank section applies at least approximately no radial force to the first interior surface ~~or the first shank section applies a second radial force to the first interior surface, the second radial force being less than the first radial force;~~ and
the composite material proximate to the first aperture is undamaged.

30. (Canceled)

31. (Previously Presented) The system of claim 29 wherein the first shank section is not in contact with the first interior surface.

32. (Original) The system of claim 29 wherein the coupling device includes a rivet.

33. (Original) The system of claim 29 wherein the coupling device includes a metallic material.

34. (Previously Presented) The system of claim 29 wherein the composite material includes a carbon fiber material and the metallic material includes aluminum.

35. (Previously Presented) The system of claim 29 wherein the first shank section of the coupling device is connected to a head, and wherein the first aperture includes a countersunk portion for receiving the head.

36. (Previously Presented) The system of claim 29 wherein the first shank section of the coupling device is connected to a head, and wherein the head has a radial extent greater than a radial extent of at least a portion of the first aperture.

37. (Previously Presented) The system of claim 29 wherein the second shank section of the coupling device is connected to a tail, the tail extending out of the second aperture, the tail having a radial extent greater than a radial extent of at least a portion of the second aperture.

38. (Previously Presented) The system of claim 29 wherein:
the first shank section of the coupling device is connected to a head, the head having a radial extent greater than a radial extent of at least a portion of the first aperture; and wherein
the second shank section of the coupling device is connected to a tail, the tail extending out of the second aperture, the tail having a greater radial extent than a radial extent of at least a portion of the second aperture.
39. (Previously Presented) The system of claim 29 wherein:
the first shank section of the coupling device is connected to a head, the head having a radial extent greater than a radial extent of at least a portion of the first aperture; and wherein
the second shank section of the coupling device is connected to a tail, the tail extending out of the second aperture, the tail having a greater radial extent than a radial extent of at least a portion of the second aperture; and wherein
the first and second structures are clamped together by the head and the tail.
40. (Original) The system of claim 29, further comprising a sealant proximate to the coupling device.
41. (Original) The system of claim 29, further comprising a vehicle, and wherein the coupling device, the first structure, and the second structure are installed in the vehicle.
42. (Currently Amended) A system of joined structures, comprising:
a first structure having a first aperture in a composite material, the first aperture having a first interior surface and a first minimum radial extent, the composite material configured so that a small radial force to the first internal surface will damage the composite material;

a second structure having a second aperture in a metallic material, the second aperture having a second interior surface and a second minimum radial extent at least approximately the same as the first minimum radial extent; and

a coupling device having a first shank section extending through the first aperture and a second shank section extending through the second aperture, but not extending into the first aperture, the first shank section of the coupling device having at least one of a hardness, toughness, and density greater than that of the second shank section of the coupling device, wherein:

a portion of the second shank section applies a first radial force to the second interior surface and the first shank section applies at least approximately no radial force to the first interior surface ~~or the first shank section applies a second lesser radial force to the first interior surface;~~ and;

the composite material proximate to the first aperture is undamaged

43. (Previously Presented) The system of claim 42 wherein the portion of the second shank section has a greater radial extent than the first shank section.

44. (Previously Presented) The system of claim 42 wherein the composite material includes a carbon fiber material and the metallic material includes an aluminum material.

45. (Currently Amended) An aircraft, comprising:

a first structure having a first aperture in a composite material, the first aperture having a first interior surface, the composite material configured so that a small radial force to the first interior surface will damage the composite material;

a second structure having a second aperture in a metallic material, the second aperture having a second interior surface, the first aperture having a minimum radial extent at least approximately the same as a minimum radial extent of the second aperture; and

a coupling device having a first shank section extending through the first aperture and a second shank section extending through the second aperture, but not extending into the first aperture, the first shank section of the coupling device having at least one of a hardness, toughness, and density greater than that of the second shank section of the coupling device, wherein:

a portion of the second shank section has a greater radial extent than the first shank section;

the portion of the second shank section applies a first radial force to the second interior surface and the first shank section applies at least approximately no radial force to the first interior surface ~~or the first shank section applies a second radial force to the first interior surface, the second radial force being less than the first radial force;~~ and

the composite material proximate to the first aperture is undamaged.

46. (Canceled)

47. (Currently Amended) An aircraft, comprising:

a first structure including a composite material, the first structure having a first aperture in the composite material, the first aperture having a first interior surface and a first minimum radial extent, the composite material configured such that a small radial force to the first interior surface will damage the composite material;

a second structure including a metallic material, the second structure having a second aperture in the metallic material, the second aperture having a

second interior surface and a second minimum radial extent at least approximately the same as the first minimum radial extent; and
a coupling device having a first shank section extending through the first aperture and a second shank section extending through the second aperture, but not extending into the first aperture, the first shank section of the coupling device having at least one of a hardness, toughness, and density greater than that of the second shank section of the coupling device, wherein:
a portion of the second shank section has a greater radial extent than the first shank section so that the portion of the second shank section applies a first radial force to the second interior surface and the first shank section applies at least approximately no radial force to the first interior surface ~~or the first shank section applies a second lesser radial force to the first interior surface~~; and wherein
the composite material proximate to the first aperture is undamaged; and
wherein
the first shank section of the coupling device is connected to a head, the head having a radial extent greater than a radial extent of at least a portion of the first aperture; and wherein
the second shank section of the coupling device is connected to a tail, the tail extending out of the second aperture, the tail having a greater radial extent than a radial extent of at least a portion of the second aperture.

48. (Original) The system of claim 47, further comprising a sealant proximate to the coupling device.

49. (Previously Presented) The aircraft of claim 45 wherein the composite material is carbon fiber and the metallic material is aluminum.

50. (Currently Amended) The system of claim 47, wherein the composite material is carbone fiber and the metallic material is aluminum.